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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/981,620	10/16/2001	Richard L. Coulson	5038-118	6345

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EXAMINER

VERBRUGGE, KEVIN

ART UNIT PAPER NUMBER

2189

DATE MAILED: 07/17/2006

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/981,620

Applicant(s)

COULSON, RICHARD L.

Examiner

Kevin Verbrugge

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 June 2006.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 107, 109-126, 128-137 and 139-148 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 107, 109-126, 128-137 and 139-148 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. _____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|---|---|
| 1) <input type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date: _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application (PTO-152) |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date: _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

This final Office action is in response to the amendment filed 6/16/06 which amended claims 107, 126, and 137 and canceled claims 108, 127, and 138. Claims 107, 109-126, 128-137, and 139-148 are therefore pending. All rejections and objections not repeated below are withdrawn. The arguments are addressed following the repeated grounds of rejection.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claims 107, 109, 110, 115, 118, 122-126, 128, 129, 134, 137, 139, 140, 145, and 148 are rejected under 35 U.S.C. 102(b) as being anticipated by UK Patent Application GB 2 286 267 A to Cohn et al.

Regarding claims 107, 126, and 137, Cohn shows the claimed elements in Fig. 1. specifically, he shows the claimed non-volatile cache memory as cache memory 106. He teaches that this cache is non-volatile at page 4, lines 21-22 and at page 5, line 29.

Further, Cohn shows the claimed controller as control system 108 and described as cache control or management logic 108 at page 5, lines 30-31. As taught by Cohn at page 5, line 31 and following, "The cache control system 108 includes a suitable microprocessor together with associated control code to enable it to perform the various functions described herein...." Those functions include the claimed spinning down of the disk, queuing operations for the disk, spinning up the disk to satisfy a read request in response to a read miss, and performing queued operations in response to the miss as claimed. See page 2, lines 1-19, page 3, lines 1-14, and page 6, lines 19-30, for example.

In these passages and others, Cohn teaches that to achieve one goal of his device (minimizing the number of disk activations), queued data is transferred from the cache to the disk once the disk has been spun up to satisfy a required disk access (such as a read miss) as claimed.

Cohn's device queues one or more operations while the disk is spun down. See the arguments section below for further discussion of this limitation.

Regarding claims 109, 128, and 139, Cohn's device spins down the disk after the read and the one or more queued operations are completed.

Regarding claims 110, 129, and 140, Cohn's queued operations include a write operation as mentioned at page 2, lines 13-14 (disk accesses which are caused by the need to maintain consistency between the data stored in the cache and on the disk are

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due to writes to the cache that need to be transferred to the disk to maintain consistency).

Regarding claims 115, 134, and 145, Cohn's device operates as claimed.

Regarding claim 118, Cohn explicitly teaches "The cache control system 108 includes a suitable microprocessor together with associated control code to enable it to perform the various functions described herein...." (emphasis added).

Regarding claim 122, Cohn's memory controller processes digital signals and is therefore a digital signal processor. If Applicants dispute this interpretation of DSP, then specific reference must be made to the specification to show why this interpretation of DSP is inappropriate.

Regarding claim 123, Cohn's memory controller is an integrated circuit with a specific application (controlling memory) and is therefore an ASIC. If Applicants dispute this interpretation of ASIC, then specific reference must be made to the specification to show why this interpretation of ASIC is inappropriate.

Regarding claim 124, Cohn's controller 108 resides with the cache in cache system 102 and in data storage apparatus 110.

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Regarding claim 125, Cohn's controller 108 is shown separate from the cache and the hard disk as claimed.

Regarding claim 148, Cohn does not limit his device to any of the claimed devices, rather he teaches that his device is useful wherever it is desired to save power with a rotating disk, which includes the devices claimed.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 111-114, 119-121, 130-133, and 141-144 are rejected under 35 U.S.C. 103(a) as being unpatentable over UK Patent Application GB 2 286 267 A to Cohn et al.

Regarding claims 111-114, 130-133, and 141-144, Cohn does not mention prefetches, but Official Notice is taken that prefetching was well-known in the art at the time of the invention. It would have been obvious to one of ordinary skill in the art at the time the invention was made to implement prefetching in Cohn's device to improve system operation by fetching data before it was needed to reduce operation time (the known benefit of prefetching).

One of the more effective uses of prefetching is for sequential streams. Once a processor determines that a request is part of a sequential stream, prefetching is implemented to obtain subsequent data of the sequential stream before it is actually needed so that when it is actually needed, it already resides in the cache and can be accessed quickly from the cache. If a request is not part of a sequential stream, prefetching may or may not be desirable (overly aggressive prefetching results in storing data in the cache that will never be used, forcing data in the cache that would have been used again to be thrown out). Prefetching is always a design tradeoff between gaining the speed advantage of having prefetched data in the cache before it is actually requested and throwing out data that will be used again to make room for prefetched data that might not be used. The small size of a cache is what makes prefetching potentially more detrimental than beneficial to operating speed.

Cohn does not teach determining if queued operations are desirable and then performing only the operations that are desirable. However, Official Notice is taken of queue operation techniques whereby more recent queue entries make older queue entries obsolete and therefore undesirable. Those undesirable queue entries are then deleted to avoid wasted operations. This typically includes memory requests to the same address where a first write to a certain address is made obsolete by a later write to the same address, for example. Since the first write is still in the queue (and has therefore not been written to memory) when the second write to the same address is placed in the queue, the first write can be deleted with no consequence to program operation as long as there are no intervening reads to that same address.

Regarding claims 119-121, Cohn may not explicitly disclose the claimed arrangements of hardware, software, and drivers, but these are mere implementation arrangements of the claimed operation and their particulars are matters of design choice. The skilled artisan possesses the knowledge required to implement Cohn's device and to modify it as his particular situation requires. Whether to implement certain features of Cohn in software or hardware is a matter of design choice.

Claims 116, 117, 135, 136, 146, and 147 are rejected under 35 U.S.C. 103(a) as being unpatentable over UK Patent Application GB 2 286 267 A to Cohn et al. in view of the IBM Technical Disclosure Bulletin NN9411421 published 11/1/94, hereinafter simply the TDB.

Cohn does not teach that his non-volatile memory is a polymer or ferroelectric memory, however it would have been obvious to one of ordinary skill in the art at the time the invention was made to make it so for the attendant advantages of polymer ferroelectric memory.

The TDB teaches that it was known to use polymer ferroelectric memories for nonvolatile storage purposes. As taught by the TDB, polymer ferroelectric memory was a known type of nonvolatile memory at the time of the invention and it therefore would

have been an obvious choice to use for the nonvolatile memory in Cohn's device. It would have been obvious to one of ordinary skill in the art at the time the invention was made to use a polymer ferroelectric memory for the design benefits that it provides, including small size, inexpensive construction, and fast response times.

Response to Arguments

Applicant's arguments filed 6/16/06 have been fully considered but they are not persuasive. Applicant essentially has only one argument: that the applied references do not teach queuing one or more disk operations while the rotating storage device is spun down. This limitation is found in previous claims 108, 127, and 138 which are incorporated by amendment into current claims 107, 126, and 137, respectively.

To support his argument, Applicant cites Cohn's teaching of destaging and argues that Cohn's destaging occurs only when disk 104 is spinning.

Applicant is correct that destaging only occurs when disk 104 is spinning, but Applicant is incorrect in arguing that Cohn does not teach the claimed queuing.

Cohn explicitly teaches at page 10, line 34, that destaging means "transferring data from the cache to disk." This is one of the two main tasks performed by the cache replacement mechanism in Cohn. The other main task performed by the cache replacement mechanism is replacement of items within the cache. This replacement is what anticipates the claimed queuing.

Replacement of items in the cache is the basic cache function of storing data at least until it can be written to disk (destaged). For example, when a processor creates a

new piece of data, it writes the new data to the cache and the cache indicates that the data just stored is new (also called dirty in the art). This indicates to the cache controller that the data has not been written to the disk yet. This allows the processor to proceed with other operations and the cache controller writes (destages) the new data to the disk at a later time. Cohn describes the "new" designation at page 7, lines 11-12 and 20-23.

Once data has been written to the disk, it is no longer new (or dirty) and can be considered consistent with the disk (also called clean in the art). See Cohn page 11, lines 29-32. We say this data has been written back to disk and this leads to the name of this type of cache: a write-back cache. The other type of cache always writes data through to disk immediately, hence its name: a write-through cache.

Other passages where Cohn clearly teaches queuing of data in the cache without writing them to the disk (since the disk is spun down) include page 2, lines 13-19 and 25-26; page 11, lines 17-19 and line 34 through page 12, line 4; page 13, lines 1-2 and 31 through page 14, line 2.

Therefore, Applicant's argument that Cohn does not teach queuing one or more operations for a rotating storage device while it is spun down is not persuasive. The rejections are maintained and made final.

Conclusion

THIS ACTION IS MADE FINAL. Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

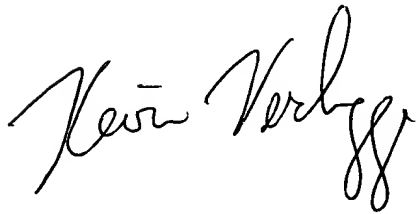
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

Any inquiry concerning this Office action should be directed to the Examiner by phone at (571) 272-4214. Any response to this Office action should be labeled appropriately (including serial number, Art Unit 2189, and type of response) and mailed to Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450, hand-carried or delivered to the Customer Service Window at the Randolph Building, 401 Dulany Street, Alexandria, VA 22313, or faxed to (571) 273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only.

For more information about the PAIR system, see <http://pair-direct.uspto.gov>.

Should you have questions on access to the Private PAIR system, contact the
Electronic Business Center (EBC) at 866-217-9197.

A handwritten signature in black ink, reading "Kevin Verbrugge". The signature is written in a cursive style with a large, looped "K" and a long, trailing "g".

Kevin Verbrugge

Primary Examiner

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